Chapter 1
Introduction

"The Pacific Coast is the land of the mountain torrent. Only in the great valleys of the enormous rivers do we have quiet flowing water, and even here the quietness is not long nor is it without a fierce strength. Most of the streams we fish are rushing and rock-broken, alternations of deep pools and white water rapids, sometimes shadowed by canyons of solid rock, sometimes spreading among built-up gravel bars. They have their own quietness, but it is the quietness of accustomed sound, their own peace, but it is the peace of energy unbounded, leaping its free way through sunlight and shade to the never-distant seas. No fisherman could ask for better things than these to live with. They are trout and salmon waters beyond all other waters of the earth. They are clean and clear, they are full of infinite variety."

Roderick Haig-Brown, Fisherman's Spring

1.1 A Steelhead Landscape

From cold mountain streams to the Pacific Ocean, the waters that shape the landscape of the Pacific Northwest also define the lifecycle of native steelhead (*Oncorhynchus mykiss*). Fast and sleek, steelhead cover thousands of miles from the time they leave their natal streams for the open ocean, then return again – often more than once – to spawn. Known for their explosive power and their preference for fast-flowing rivers, these fish have long held a special place in the lore of Northwest anglers. Traditional Native American culture in the Pacific Northwest is also inextricably tied to steelhead and other anadromous salmonids. For many Northwest Indian peoples, these fish have always provided an essential source of food, a focal point of religious life and a central commodity for trade and commerce. A Northwest icon, steelhead were designated by the legislature as the Washington State fish in 1969.

Steelhead have also been the focus of significant controversy. Construction and operation of dams, habitat degradation, hatchery programs, and fishing have all sparked long and continuing debates, blue-ribbon panel reviews, and research papers. Two reviews of particular note -- "Upstream: Salmon and Society in the Pacific Northwest", by the National Research Council (1996), and the Royal report, commissioned by the Washington Department of Game in 1973, have had a substantial impact on fishery management in the Pacific Northwest.

Why, in the face of the already extensive literature, have we invested substantial time and energy in the development of yet another report? This report is not simply an assessment of Washington's steelhead populations or a critique of current management practices. Rather, it is designed to lay the foundation for the development of improved management plans, scheduled to begin this year, that assure the productivity of Washington's steelhead for future generations. To achieve this goal, we established four primary objectives for this report:

1) **Promote Progress in the Continued Evolution of Fisheries Management.** The underlying paradigm for fishery management is rapidly shifting from an approach that simply focused on the abundance of a single species to one that considers multi-attribute population assessments and community ecology (McElhany et al. 2000; HSRG 2004; Walters and Martell 2004; Mangel and Levin 2005). Abundance, productivity, spatial structure, and diversity all contribute to the maintenance of viable salmonid populations (VSP). We review these concepts and describe their potential application to the management of steelhead.

2) **Reduce Information Lag**. A significant lag often exists between the completion of research or a monitoring project and its application in management. New genetic analyses, computers, and computer applications like Geographic Information Systems (GIS) are revolutionizing fishery management. We seek to reduce information lag by providing access to cutting-edge analyses, including new methods for evaluating hatchery programs, assessing the historical distribution of steelhead, and estimating the risk of extinction.

3) **Collate Existing Data and Provide Statewide Perspective**. What is the status of Washington's steelhead populations and how do they vary throughout the state? Collation of existing information is a key step in the development of a management plan. Research in other parts of the state or the region can sometimes help answer a local question that has been difficult to resolve.

4) **Identify Critical Research, Monitoring, and Evaluation Needs**. The significant conservation concerns facing some steelhead populations and the rapid evolution in fishery management may require changes in monitoring and analysis. Are we collecting the data we need? Is it accessible? Preparation of this report provides an opportunity to evaluate our capabilities and identify key research, monitoring, and evaluation needs.

Steelhead are currently listed under the Endangered Species Act in four regions of Washington (Lower Columbia, Middle Columbia, Upper Columbia, Snake River) and listing has recently been proposed for populations in Puget Sound. Populations in many Washington coastal rivers remain strong. Our effectiveness in protecting and restoring steelhead populations and the habitat on which they rely will help shape the steelhead landscape for future generations.

1.2 Report Structure

We have organized this report into seven chapters, beginning with a brief overview of the biology of steelhead (Chapter 2), an assessment of artificial production (Chapter 3), and a review of management (Chapter 4). The final three chapters assess the status of steelhead, including Population Structure (Chapter 5), Diversity and Spatial Structure (Chapter 6), and Abundance and Productivity (Chapter 7). The chapters are framed around a series of questions designed to stimulate discussion and focus subsequent analyses. Each chapter ends with Findings and Recommendations driven by the analyses.

Although we have attempted to include as much relevant information in this report as possible, we recognize that some important work may have been missed and additional results from ongoing research and monitoring can be expected. To address these issues, the report has been compartmentalized to facilitate future updates. There has also been an attempt to provide Internet links in each section to help the reader pursue additional information and access posted data as they become available.

Effective resource management requires the ability to quickly access and analyze current and historical data. In the preparation of this report, we found that historical

steelhead data were often difficult to obtain or contradictory. Indeed, a substantial amount of the time required to complete this report was invested in data collection and a preliminary reconciliation of conflicting information. The redoubling of efforts to improve the accuracy and accessibility of historical data was one substantive benefit resulting from the preparation of this report, and one that will become increasingly important to complete. Many biologists familiar with historical steelhead data are now reaching an age at which retirement from WDFW may occur.

The quality of the data available to assess steelhead populations and programs in Washington varies substantially through time, with data of higher quality generally becoming available in the late 1970s. Four particularly important enhancements were: 1) the initiation in 1962 of a 12-month catch record card (CRC) to record recreational catches; 2) the development and implementation for the 1974-1975 season of a bias correction factor for the CRC estimate of recreational catch; 3) the extension in the late 1970s of intensive spawners surveys to a broader range of watersheds; and 4) marking of hatchery-origin steelhead provided the ability to estimate the catch of natural and hatchery-origin steelhead in the mid-1980s. Because of the substantial changes in the types and quality of data collected, comparisons of current and historical data on steelhead populations can be difficult. For this reason, most of the analyses in this report rely on data collected since the late 1970s.

1.3 Report Authorship and Tribal Review

This report was written by the Washington Department of Fish and Wildlife (WDFW). Many of Washington's steelhead stocks and fisheries are managed jointly with Native American tribes in a unique government-to-government relationship defined by treaties, court decisions, and legislation. Some tribal staff assisted in the development of the outline for this report, provided data, or reviewed earlier drafts of the report. However, tribal staff assistance in the preparation and review of this report does not necessarily imply tribal agreement with report content.

1.4 References Cited

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